

BKW65N40HZ1

650V 40A Trench FS IGBT



Description

The BKW65N40HZ1 is a Trench FS IGBT utilizing bestirpower's advanced technology, which achieves an exceptionally low gate charge. It achieves significantly higher efficiency through optimized gate charge management, while its user-friendly design offers designers advantages such as low EMI and reduced switching losses.

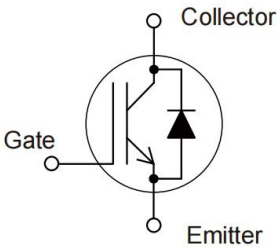
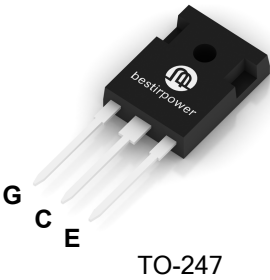
V _{CE}	I _C (T _C = 100°C)	V _{CEsat}	Q _{g,typ}
650 V	40 A	1.8 V	71 nC

Applications

- Solar Converters
- Uninterrupted Power Supply
- Welding Converters

Features

- High Breakdown Voltage to 650V for Improved Reliability
- Trench-Stop Technology Offering :
- Very Tight Parameter Distribution
- High Ruggedness, Temperature Stable behavior
- High Speed Switching
- Low Switching Losses
- Easy Parallel Switching Capability Due to Positive Temperature Coefficient in V_{CEsat}



Absolute Maximum Ratings

Symbol	Parameter		Value max	Unit	Note
V _{CE}	Collector-emitter voltage (T _{vj} ≥ 25 °C)		650	V	
V _{GE}	Gate-emitter voltage		±20	V	
I _C	DC collector current, limited by T _{vjmax}	T _C = 25°C	80	A	
		T _C = 100°C	40	A	
I _{Cpulse}	Pulsed collector current, V _{GE} =15V, tp Limited by T _{Jmax}		120	A	
P _D	Power Dissipation	T _C = 25°C	197	W	Fig.21
		T _C = 100°C	98		
I _F	Diode forward current, limited by T _{vjmax}	T _C = 25°C	80	A	
		T _C = 100°C	40		
T _J	Operating junction temperature		-40~ 175	°C	
T _{STG}	Storage temperature range		-55~ 150	°C	

Thermal Resistance

Symbol	Parameter	Value	Unit
R _{th(j-a)}	Thermal resistance, junction-ambient	40	°C/W
R _{th(j-c)}	Thermal resistance, IGBT junction to case	0.76	°C/W
R _{th(j-c)}	Thermal resistance, diodes junction to case	1.1	°C/W

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	Note
Statistic Characteristics							
$V_{(BR)CES}$	Collector-emitter Breakdown Voltage	$V_{GE}=0V, I_C=0.25mA$	650	-	-	V	
I_{CES}	Collector Cut-off Current	$V_{CE}=650V, V_{GE}=0V$	-	-	40	μA	
I_{GES}	Gate-emitter Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	400	nA	
$V_{GE(TH)}$	Gate Threshold Voltage	$V_{CE}=V_{GE}, I_C=250\mu A$	3.6	4.4	5.2	V	Fig.3 5
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V$ $I_C=40A$ $T_J=25^\circ\text{C}$	-	1.8	2.3	V	Fig. 4
		$T_J=175^\circ\text{C}$	-	2.4	-		

Dynamic Characteristics

C_{ies}	Input Capacitance	$V_{CE}=25V,$ $V_{GE}=0V, f=1MHz$	-	2220	-	pF	Fig.7
C_{oes}	Output Capacitance		-	99	-		
C_{res}	Reverse Transfer Capacitance		-	12	-		

Gate Charge Characteristics

Q_g	Gate Charge Total	$V_{CE}=520V,$ $I_C=40A, V_{GE}=0 \text{ to } 15V$	-	71	-	nC	
Q_{GE}	Gate to Emitter Charge		-	15	-	nC	
Q_{GC}	Gate to Ccollector Charge		-	22	-	nC	

Drain-Source Body Diode Characteristics

V_F	Diode Forward Voltage	$I_F=40A, T_J=25^\circ\text{C}$	-	2.0	-	V	Fig.8
		$I_F=40A, T_J=175^\circ\text{C}$	-	1.6	-		
T_{rr}	Reverse Recovery Time	$V_R=400V, I_F=40A$ $diF/dt = 760A/us, T_J = 25^\circ\text{C}$	-	112	-	ns	Fig.17 18.19
Q_{rr}	Reverse Recovery Charge		-	0.6	-	μC	
I_{rr}	Diode Peak Reverse Recovery Current		-	10	-	A	

Typical Performance Characteristics

Figure1: Output Characteristic VCE vs. IC at 25 °C

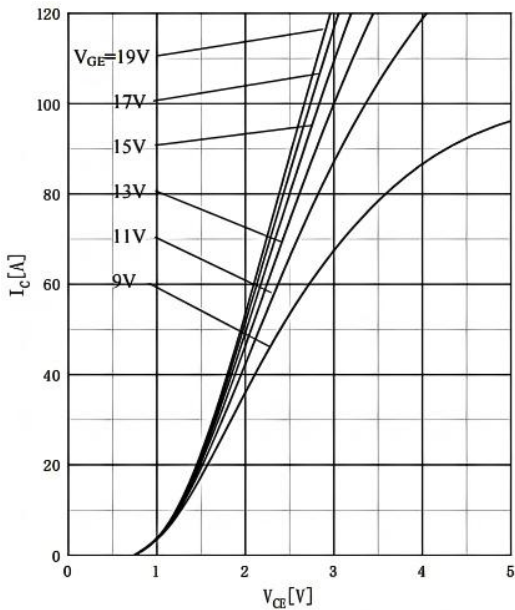


Figure 2: Output Characteristic VCE vs. IC at 175 °C

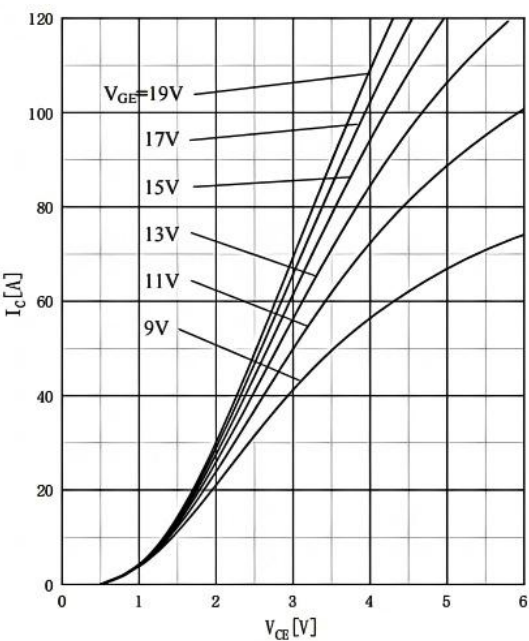


Figure 3: Transfer characteristic VGE vs. IC

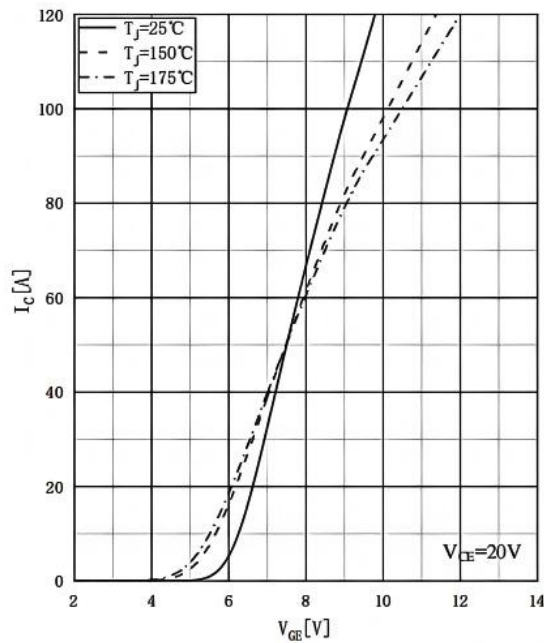
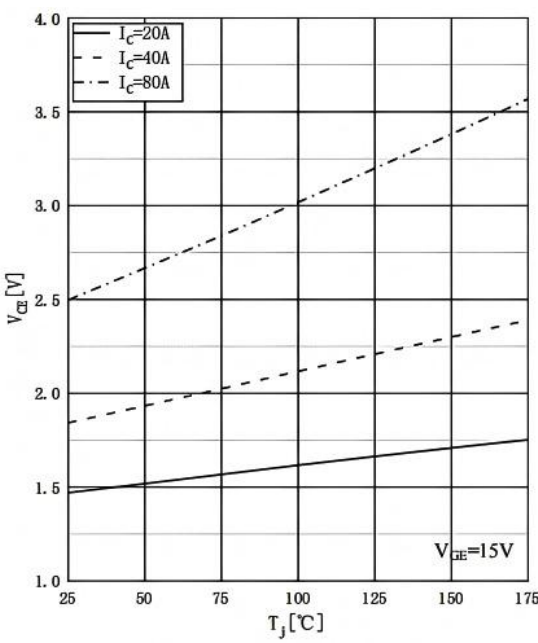


Figure 4: Collector-emitter saturation voltage as a function of junction temperature VCEsat vs. TJ



Typical Performance Characteristics

Figure 5: Gate-emitter threshold voltage as a function of junction temperature $V_{GE(th)}$ vs. T_J

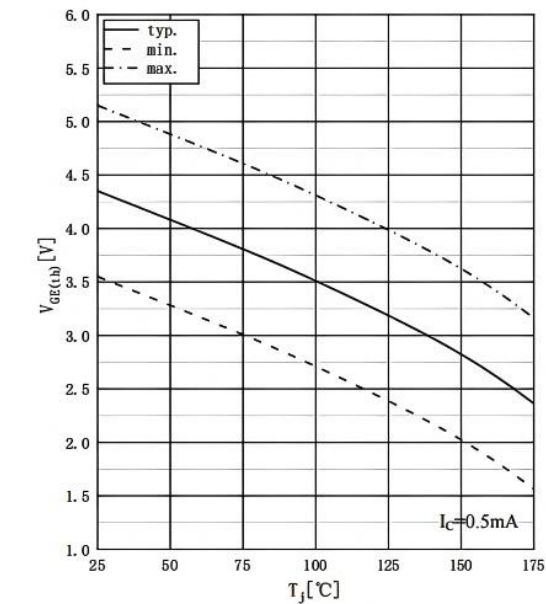


Figure 6: Gate Charge Q_G

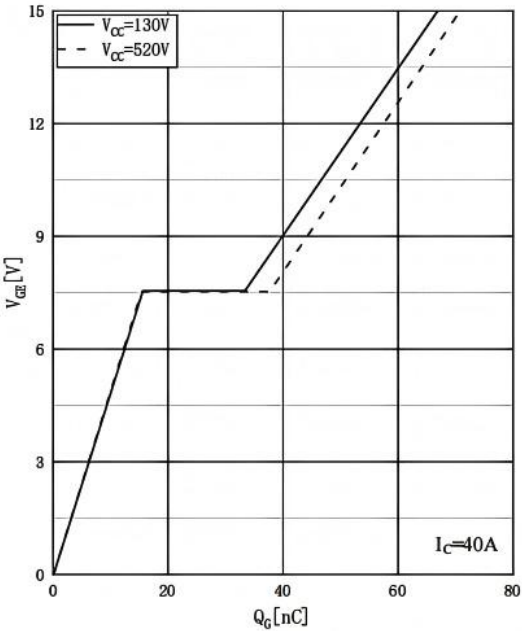


Figure 7: Capacitance Characteristic

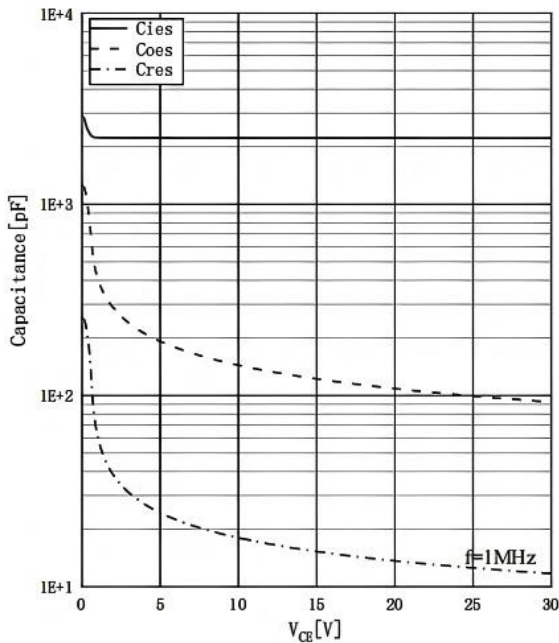
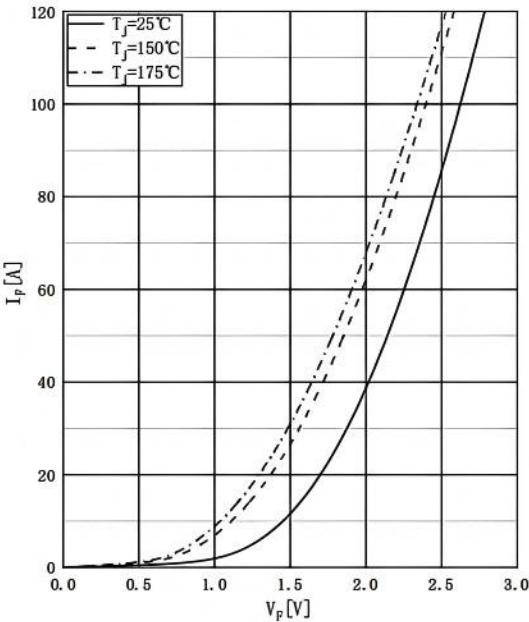


Figure 8: Diode forward current as a function of forward voltage V_F vs. I_F



Typical Performance Characteristics

Figure 9: Diode forward voltage as a function of junction Temperature VF vs. Tj

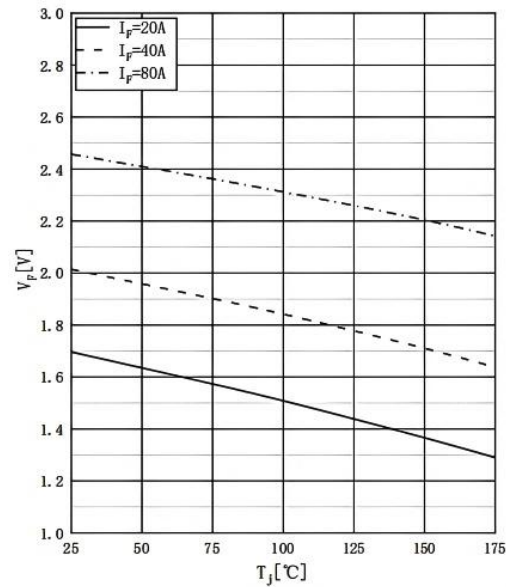


Figure 10: Switching times vs. Collector current IC

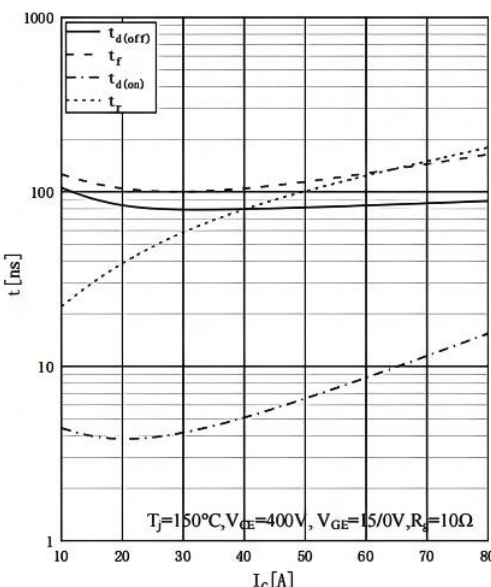


Figure 11: Switching times vs. Gate resistor Rg

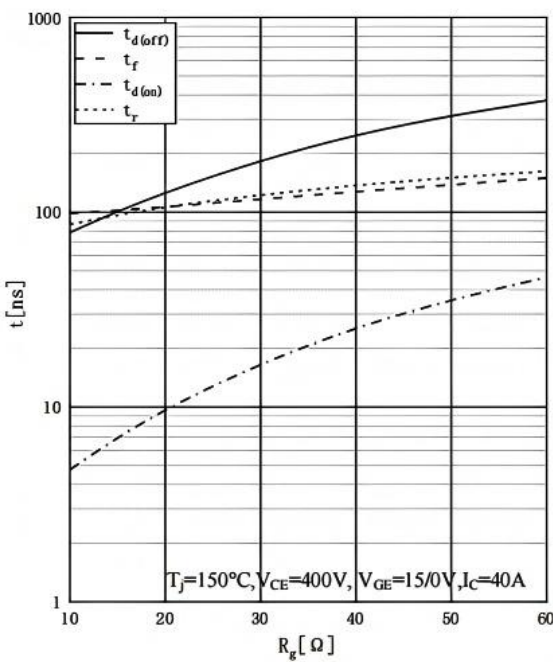
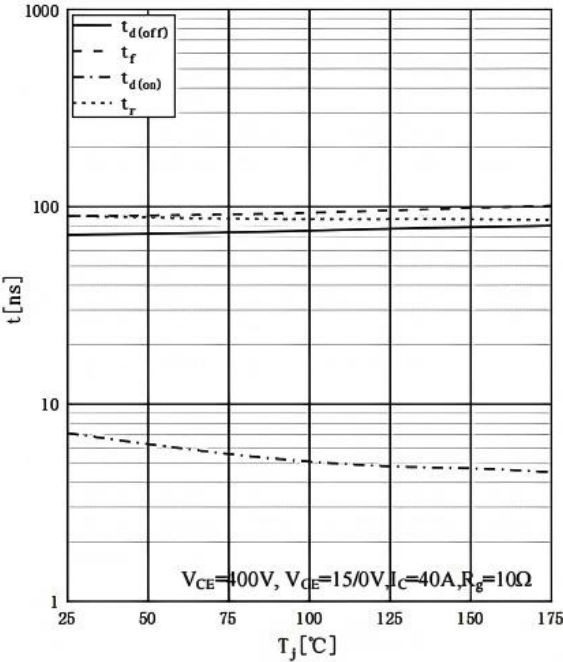


Figure 12: Switching times vs. Junction temperature Tj



Typical Performance Characteristics

Figure 13: Switching energy loss vs. Collector current I_C

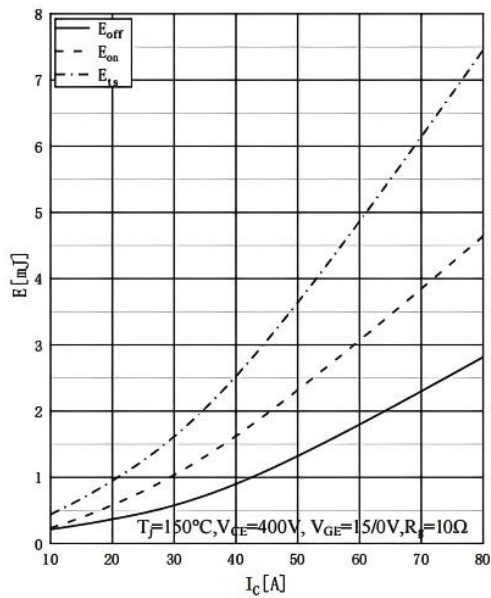


Figure 14: Switching energy loss vs. Gate resistor R_g

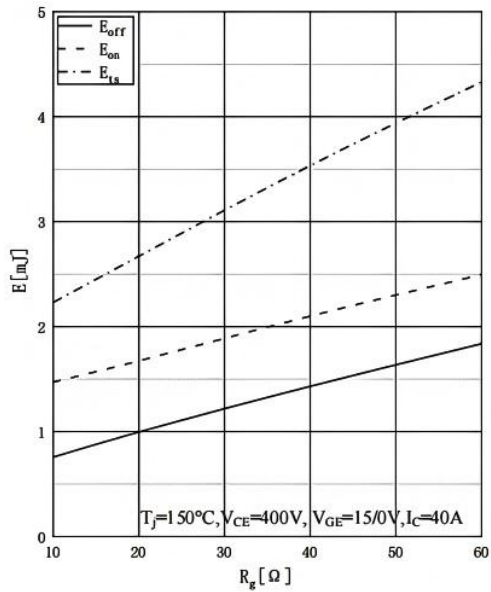


Figure 15: Switching energy loss vs. Junction temperature T_J

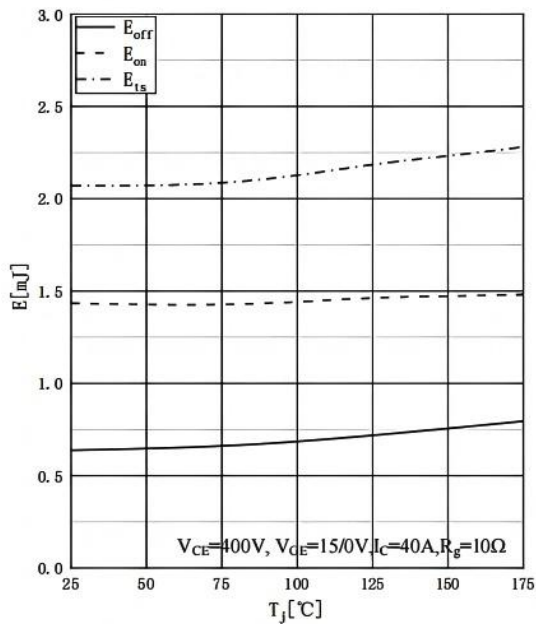
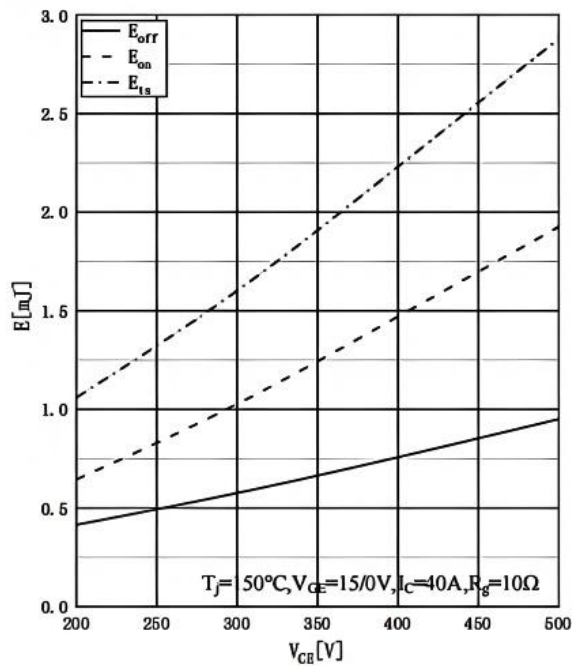


Figure 16: Switching energy loss vs. Collector-emitter voltage V_{CE}



Typical Performance Characteristics

Figure 17: Reverse recovery times as a function of diode current slope t_{rr} vs. di_F/dt

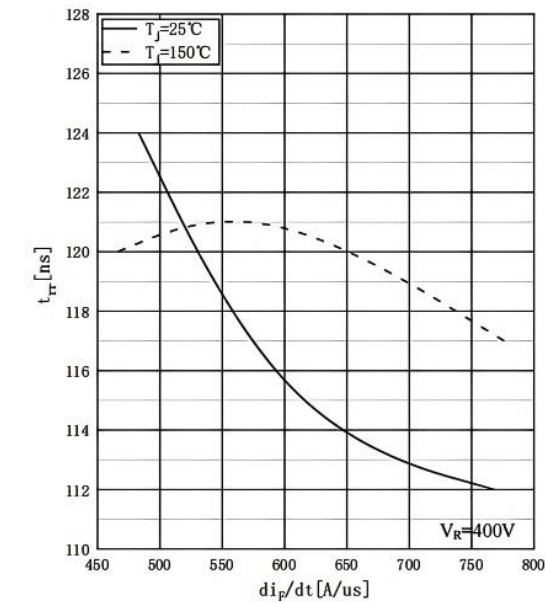


Figure 18: Reverse recovery times as a function of diode current slope Q_{rr} vs. di_F/dt

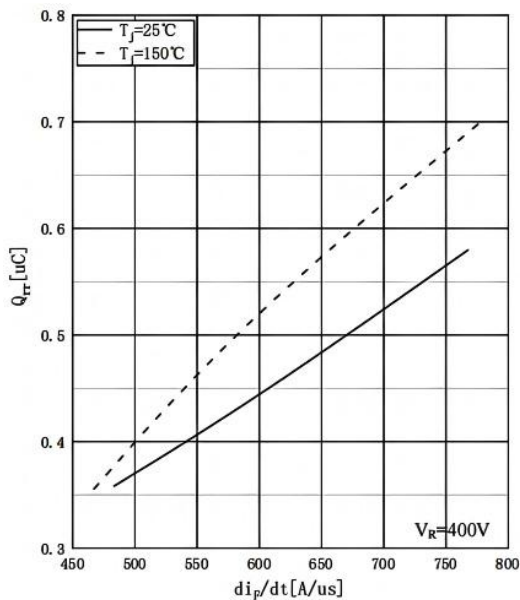


Figure 19: Reverse recovery times as a function of diode current slope I_{rr} vs. di_F/dt

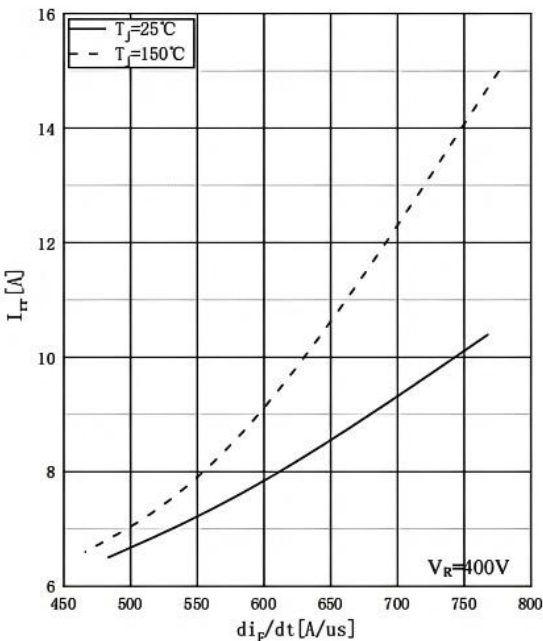
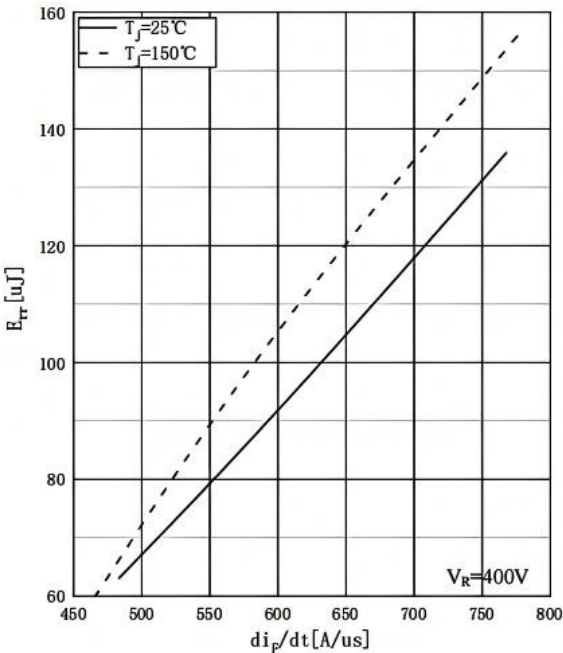


Figure 20: Reverse recovery times as a function of diode current slope E_{rr} vs. di_F/dt



Typical Performance Characteristics

Figure 21: Power dissipation as a function of case temperature P_{tot} vs. T_C

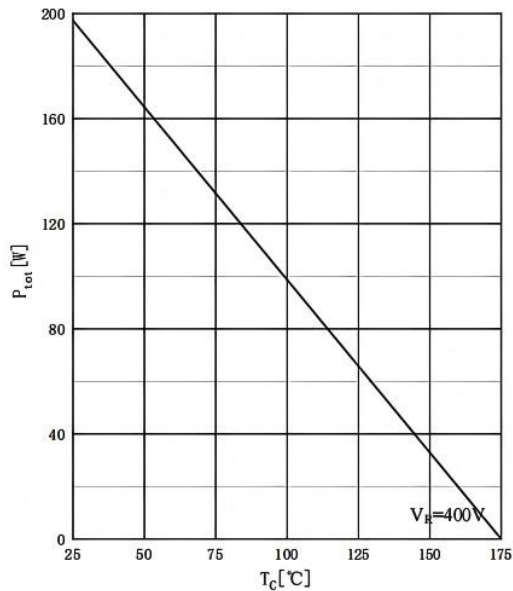


Figure 22: FBSOA characteristic

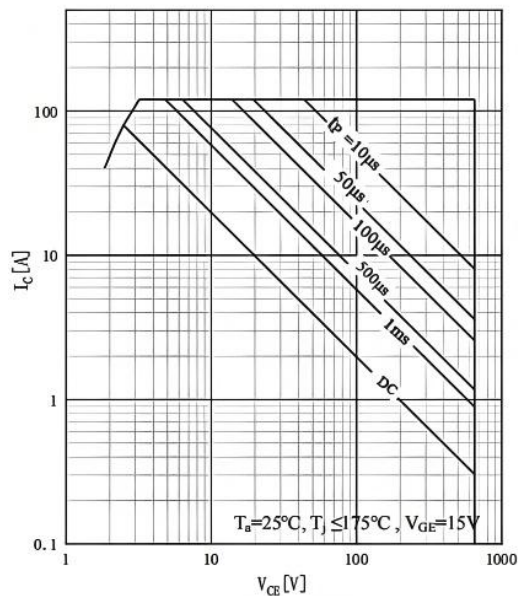


Figure 23: IGBT transient thermal impedance Z_{thjc}

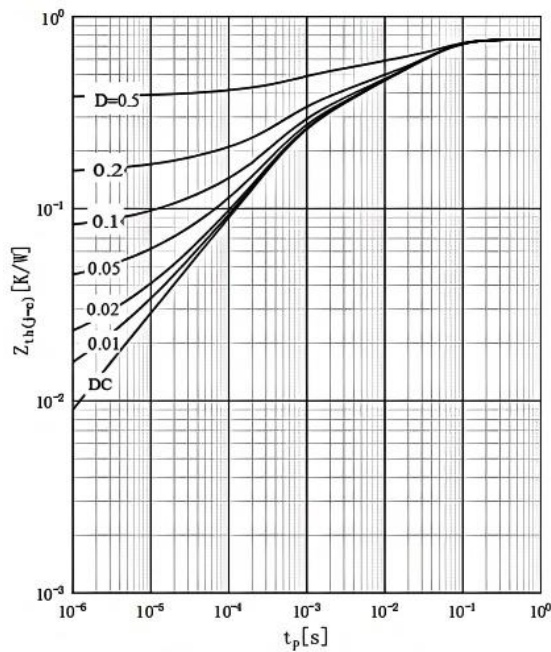
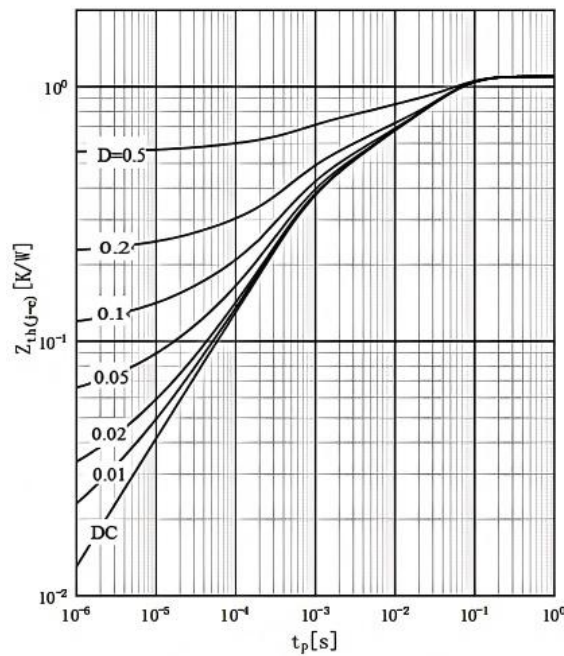
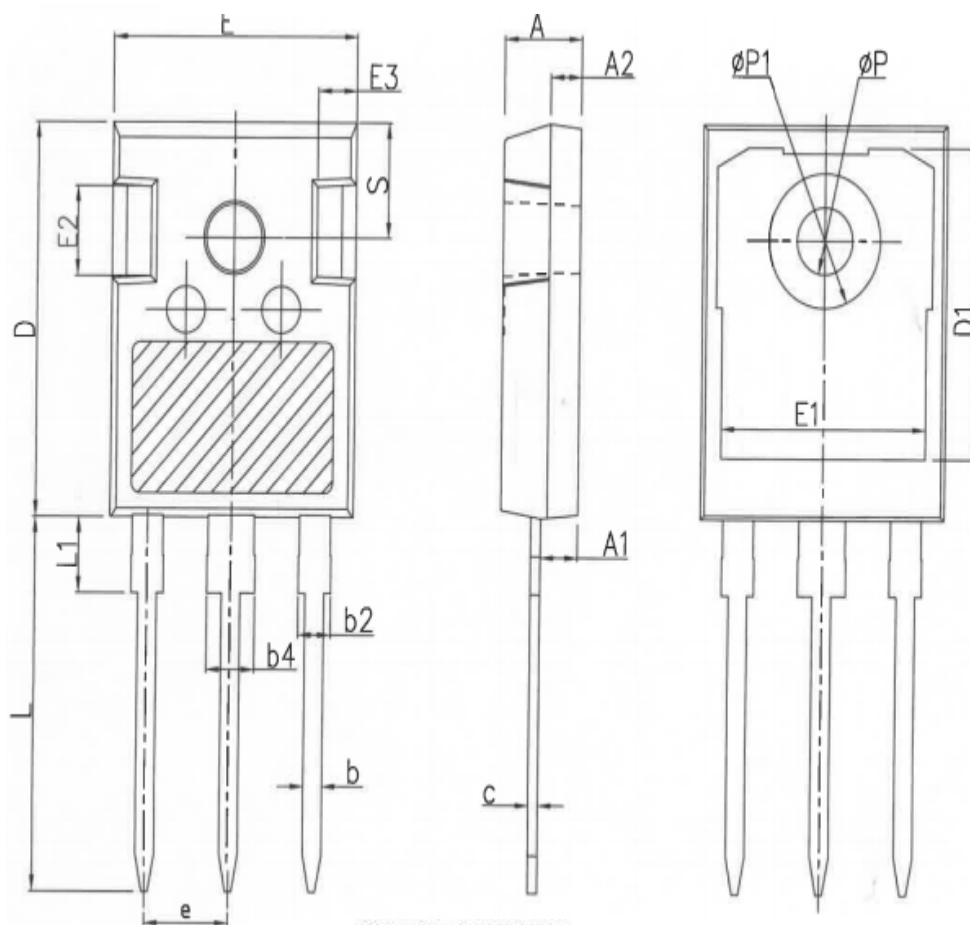


Figure 24: Diode transient thermal impedance Z_{thjc}



Package Outlines

TO247-3



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	—	—	4.30
ϕP	3.40	3.60	3.80
ϕP_1	—	—	7.30
S	6.15BSC		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BKW65N40HZ1	BKW65N40HZ1	TO247-3L	Tube	30 units

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